

Appendix D

Additional Analysis of
Alternatives A Through F

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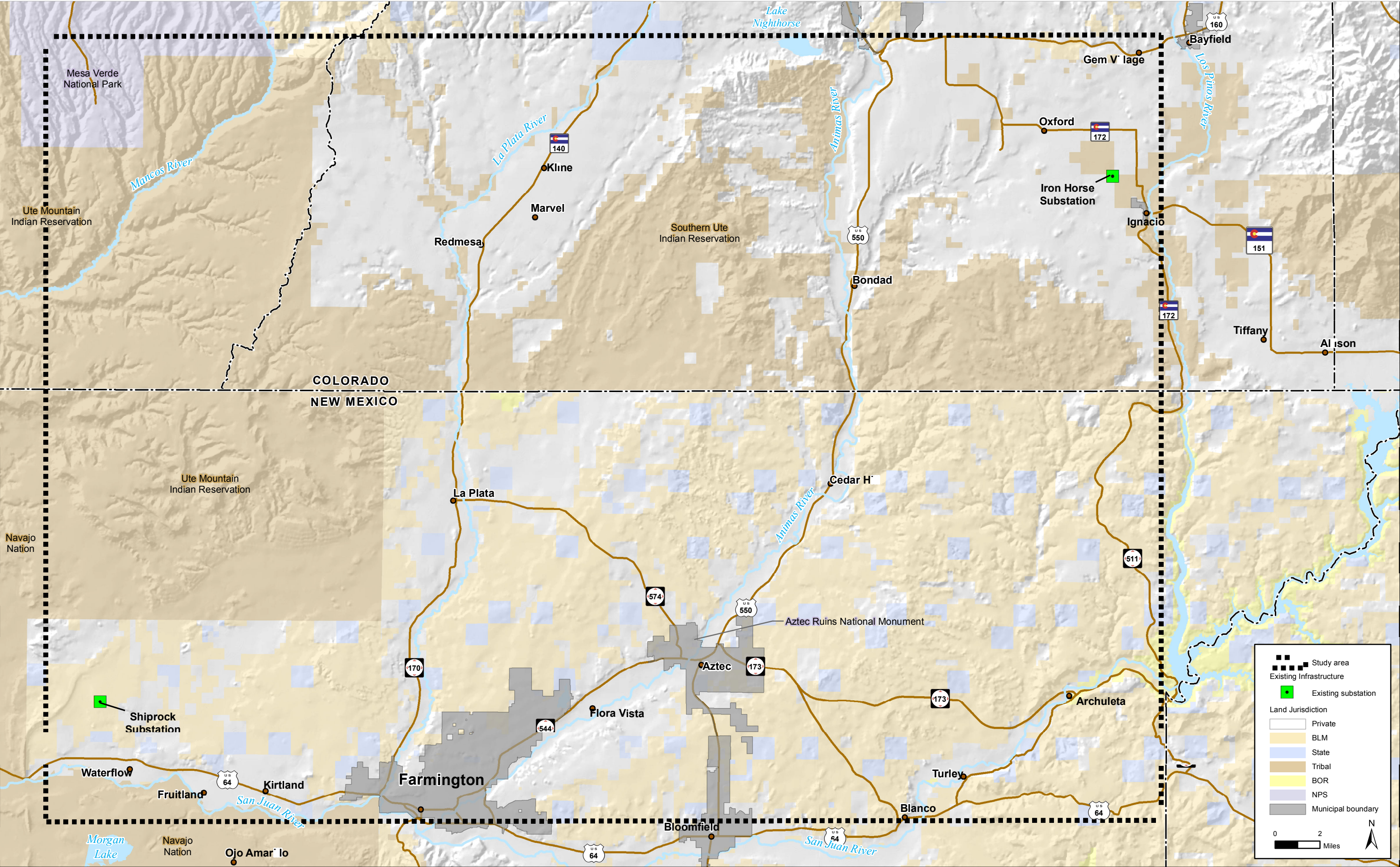
Appendix D contains additional discussion and analysis of six alternatives (Alternatives A through F) that were developed as described in the Route Refinement Report (Appendix C).

D.1 Study Area

The study area is generally located in San Juan County, New Mexico, and La Plata County, Colorado as shown in Exhibit D-1, Study Area. The study area extends from within 1 mile of Farmington, New Mexico, and within 3 miles of the Navajo Nation, to within 5 miles of Durango, Colorado. The study area covers approximately 174,096 acres of mixed federal, state, tribal, and private lands. Federal lands in the study area are managed by the BLM Farmington Field Office (FFO) and Bureau of Indian Affairs (BIA), Southern Ute Agency.

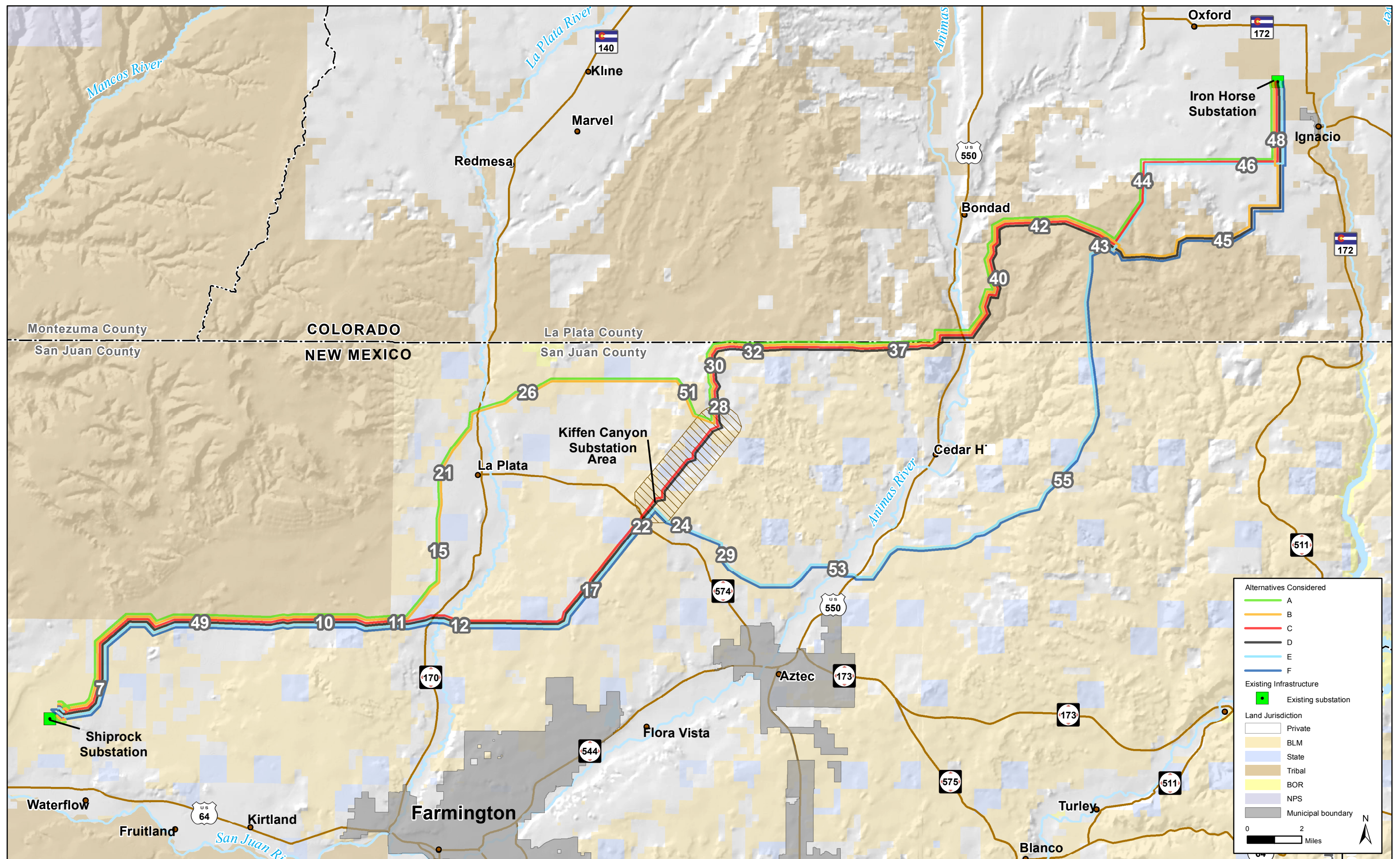
D.2 Alternatives A through F

The alternatives analyzed in this appendix are shown in Exhibit D-2, Alternatives A Through F. A brief description of these alternatives is provided below.



Source: GIS BLM 2012, GIS CDOT and SJC 2012, GIS Tri-State 2013

Exhibit D-1 Study Area



D.2.1 Alternative A

Route Segments 7, 49, 10, 11, 15, 21, 26, 51, 28, 30, 32, 37, 40, 42, 43, 44, 46, and 48 make up the approximately 68-mile-long Alternative A shown above in Exhibit D-2, “Alternatives A Through F.”

Alternative A would follow an existing 345 kV transmission line out of Shiprock Substation north and east for approximately 13.7 miles. Alternative A would then follow an existing natural gas pipeline corridor and oil and gas well access roads for 6 miles north through the BLM Thomas Canyon Recreation/Wildlife Area. At a point just east of the Thomas Canyon Recreation/Wildlife Area, Alternative A would travel northeast and parallel the former La Plata Mine coal haul road to the north and east for approximately 4.8 miles. At this point, Alternative A would turn east and follow a large CO₂ pipeline corridor for approximately 7.5 miles before reaching the proposed Kiffen Canyon Substation Area. From the Kiffen Canyon Substation Area, Alternative A would continue north. Approximately 0.25 mile south of the New Mexico and Colorado state line, Alternative A would follow the state line using oil and gas well access roads for approximately 8.5 miles to the Animas River. Alternative A would cross the Animas River and US 550 with one span just north of the state line, and would then cross SUIT land in Colorado. At the end of Route Segment 43, Alternative A would follow oil and gas well access roads north for approximately 3.6 miles to a point that is just east of the intersection of County Roads (CR) 309A and CR 319. From here, Alternative A would follow CR 319 for approximately 5 miles east before it follows the La Plata Electric Association’s (LPEA) 115 kV Iron Horse transmission line north for approximately 3 miles to the interconnection point with the existing Iron Horse Substation.

D.2.2 Alternative B

Alternative B is approximately 68 miles long and consists of Route Segments 7, 49, 10, 11, 15, 21, 26, 51, 28, 30, 32, 37, 40, 42, 43, 45, and 48 as shown in Exhibit D-2.

Alternative B would follow the same alignment as described above for Alternative A until the endpoint of Route Segment 43 in

Colorado. From that endpoint, Alternative B would parallel CR 319. Then it would share structures with the existing LPEA Iron Horse line for approximately 4.5 miles; the transmission line would end at the existing Iron Horse Substation.

D.2.3 Alternative C

Alternative C is approximately 65 miles long and follows Route Segments 7, 49, 10, 11, 12, 17, 22, 27, 28, 30, 32, 37, 40, 42, 43, 44, 46, and 48 shown in Exhibit D-2.

Alternative C would begin near Western's Shiprock Substation and would parallel Western's existing 345 kV transmission line north out of Shiprock Substation for approximately 2.7 miles. It would continue to parallel the same 345 kV transmission line east for approximately 15.9 miles. At the La Plata River, Alternative C would continue to parallel Western's existing 345 kV transmission line. Approximately 4 miles east of the La Plata River Crossing, Alternative C would continue to parallel Western's 345 kV transmission line and the City of Farmington's 115 kV transmission line northeast through BLM's Glade Run Recreation Area for approximately 10.5 miles to the proposed Kiffen Canyon Substation Area.

Approximately 0.25 mile south of the New Mexico and Colorado state line, Alternative C would deviate from the existing 115 kV and 345 kV transmission lines and would follow the state line using existing oil and gas well access roads for approximately 8.5 miles to the Animas River. Alternative C would cross the Animas River and US 550 with one span just north of the state line and then would cross SUIT land in Colorado. From this point, Alternative C would follow existing oil and gas well access roads and a pipeline corridor north and east for approximately 16.5 miles. At the endpoint of Route Segment 43, Alternative C would follow the same alignment as Alternative A up to the interconnection point with the Iron Horse Substation.

D.2.4 Alternative D

Alternative D is approximately 65 miles long and consists of Route Segments 7, 49, 10, 11, 12, 17, 22, 27, 28, 30, 32, 37, 40, 42, 43, 45, and 48 shown in Exhibit D-2.

Up to Route Segment 43, Alternative D would follow the same alignment as Alternative C. At Route Segment 43, Alternative D would follow the same alignment as Alternative B, which includes paralleling CR 319 and sharing structures with the existing LPEA Iron Horse line for approximately 4.5 miles.

D.2.5 Alternative E

Alternative E is approximately 67 miles and is made up of Route Segments 7, 49, 10, 11, 12, 17, 22, 24, 29, 54, 55, 44, 46, and 48 shown in Exhibit D-2.

Between the Shiprock Substation and the terminus of Route Segment 22, Alternative E would follow the same alignment through the Glade Run Recreation Area to the proposed Kiffen Canyon Substation Area as Alternatives C and D described above. From the Kiffen Canyon Substation Area, portions of Alternative E would follow a 115 kV transmission line and oil and gas well access roads east and southeast for approximately 7.8 miles to the southern Animas River crossing, approximately 4 miles north of Aztec. To the extent feasible, Alternative E would parallel property or parcel lines on the eastern side of the Animas River to avoid effects to landowners. After crossing the Animas River and US 550, Alternative E would parallel Road 2651 and a natural gas pipeline north and northeast for approximately 6 miles. From this point, Alternative E would parallel the Arkansas Loop Road and a large natural gas pipeline corridor for 10.8 miles to the end of Segment 55. Because of the oil and gas development located along the Arkansas Loop Road, the transmission line would need to be offset from the road by as much as 0.5 mile to allow adequate space between the transmission line and existing facilities. From the end of Segment 55, Alternative E would follow the same alignment as Alternatives A and C until its interconnection point at the existing Iron Horse Substation.

D.2.6 Alternative F

Alternative F is approximately 68 miles long and would use Route Segments 7, 49, 10, 11, 12, 17, 22, 24, 29, 53, 55, 45, and 48 as shown in Exhibit D-2.

Alternative F would use the same alignment as Alternative E in New Mexico and the same alignment as Alternatives B and D in Colorado.

D.3 Methods

Alternatives A through F were evaluated and compared by gathering resource and land use GIS data and conducting a desktop study of the proposed transmission line based on the information collected. In 2009 and 2010, helicopter reconnaissance and windshield-level field reconnaissance trips were completed to ground-truth and refine the data collected. In addition, various data sources, such as land use plans, were used to describe existing conditions.

Specific data sets that were collected are listed in Section 3.4 of the Route Refinement Report (Appendix C), and data maps are located in Appendix B of the Route Refinement Report. Data collected fall into the broad categories below:

- Land Ownership and Use
- Socioeconomics
- Visual Resources
- Transportation
- Minerals
- Geology and Soils
- Vegetation
- Water Resources and Wetlands
- Biological Resources
- Cultural Resources

For visual resources, Visual Resource Management (VRM) GIS data updated in 2013 was used.¹

¹ GIS BLM 2013a

D.4 Affected Environment

D.4.1 Land Ownership and Use

D.4.1.1 Regional Setting and Existing Land Use

Northwestern New Mexico and southwestern Colorado are on the west slope of the continental divide. The San Juan River drainage basin dominates the landscape in northwestern San Juan County, New Mexico. River valleys and washes, mesas, and undulating uplands punctuate the landscape along the New Mexico and Colorado border. Riparian areas exist along drainage areas, especially adjacent to the San Juan, La Plata, and Animas Rivers.

Oil and gas development and coal extraction are central features to the northwestern New Mexico and southwestern Colorado landscape. Grazing and irrigated agriculture is found along the San Juan, Animas, and La Plata Rivers. Urban development in the region is largely concentrated in the cities of Farmington and Aztec. In southeastern La Plata County, Colorado, the towns of Durango, Ignacio, and Bayfield are the main urban centers.

Communication facilities, which occur frequently throughout the study area, are mostly located in proximity to population centers, although some communication facilities are located sporadically throughout the study area, outside the population centers. Existing linear disturbance also occurs frequently throughout the study area and includes transmission lines, roads, and railroads. Existing linear disturbance is favorable in terms of transmission line routing, and was considered a priority during transmission line routing. There are several transmission lines located in the southwestern portion of the study area including six 345kV transmission lines and several 115kV transmission lines located near the San Juan Generation Station. Gas pipelines within the study area occur mostly within the northeastern portion of the study area.

D.4.1.2 Land Use Plans and Policies

The study area encompasses federal, state, and private lands in New Mexico and tribal and private lands in Colorado as shown in Exhibit D-1. In New Mexico, most of the study area is on BLM-managed land within the BLM Farmington Field Office (FFO). The remaining portions of the study area in New Mexico are on state and private land. There are two primary entities responsible for

land use planning within the study area in New Mexico: the BLM and San Juan County. In Colorado, the study area includes SUIT and private lands located in La Plata County.

BLM FFO

The BLM FFO is responsible for managing 1.4 million surface acres of public lands, which is roughly half of the total area in the San Juan Basin. The BLM FFO's approved Resource Management Plan (RMP) Record of Decision was signed in September 2003.² The RMP planning area includes all of San Juan County, northern McKinley County, western Rio Arriba County, and the northwestern portion of Sandoval County in New Mexico.

Consistent with the multiple-use, sustained-yield mandate of the Federal Lands Policy and Management Act of 1976 (Public Law 94-579), the Farmington RMP contains land use management objectives. Oil and gas development is the foremost activity on BLM-managed lands in the FFO. On BLM-managed lands in the planning area, there are approximately 18,000 active oil and gas wells and 2,400 existing leases for oil and gas. Corresponding development and maintenance of access roads, pipelines, energy transmission lines, and communication sites is a primary activity on public land in the region. Management goals in the RMP address the need to support further development of energy resources while maintaining natural and cultural resources and providing recreation opportunities.³

To protect, maintain, and enhance the special resource values on public lands the FFO identifies areas that have special resource values where some uses may be restricted in order to protect the resources. These areas include Special Designated Areas (SDAs), Areas of Critical Environmental Concern (ACECs), Wilderness Areas, Special Recreation Management Areas, Research Natural Areas, and other designated Wildlife Areas and Riparian Areas. The following specially designated areas are identified in the study area; these areas are mapped in Exhibit D-9, BLM Special Designated Areas.

² BLM 2003

³ BLM 2003

Hogback ACEC

The Hogback ACEC is located in the western corner of the field office. The Hogback ACEC remains an important area of both regional and national significance for conservation and study of rare plants. All known populations of Mancos milkvetch (*Astragalus humillimus*) and Mesa Verde cactus (*Sclerocactus mesae-verdae*) that occur on lands managed by the field office are within the Hogback ACEC. In addition, this area also contains several other plant species, which are rare or endemic to New Mexico. The ACEC also contains the southernmost range extension of several species including small-leaf mahogany (*Cerocarpus intricatus*) and singleleaf ash (*Fraxinus anomala*). As such, it is of significant scientific value as an area for studying ecotonal relationships. The major objective of the ACEC is to protect the most important bald eagle wintering habitat, as well as protecting the bald eagles that use these areas in the winter.

Pinon Mesa Recreation Area

This area is managed to provide and protect recreational, paleontological, and visual values.

Thomas Canyon Recreation/Wildlife Area

The area is heavily forested (pinon and juniper) with small pockets of ponderosa pine. The topography generally slopes from higher elevations in the west to lower elevations in the east with dissecting steep-sided canyons. The pinon-juniper habitat site supports large herds of wintering mule deer. Natural values within the area are considered important and somewhat rare in an otherwise extensively developed region. The area lies approximately 14 air miles north of Farmington, New Mexico, and is the only relatively undisturbed natural environment of its size within a 30-mile radius of the city. Scenic values are associated with the botanical, wildlife, geological, and natural features of the area. The area is managed for the optimal combination of primitive recreational opportunities and wildlife protection.

East La Plata Wildlife Area

Historically, this area received heavy winter deer use. When it was designated in the RMP, it supported about 60 to 100 deer,

depending upon the severity of the winter. The existing browse was in poor condition and needed improvement. The area is managed to protect and preserve big game habitat.

Glade Run Recreation Area

The recreation area contains a network of established roads, dry washes, and designated trails that provide for a variety of outdoor recreation opportunities. Various portions of this network have been ridden by local off-road vehicle enthusiasts for over 40 years and, more recently, by mountain bicyclists. The Glade is home of the Road Apple Rally, the longest continually held mountain bike race in the US. In general, the trail system can be described as rolling terrain that peaks on ridge tops and bottoms out in valley floors. Surface soils vary from deep sands to rock to hard-packed gravel or maintained roads. Forested woodlands feature pinon-juniper cover in some areas with sagebrush flats dominating other areas. The sights and sounds one can expect to encounter vary from those found in an environment of paved roads, housing developments, power lines, moderate vehicular traffic, and other urban noises to areas natural in appearance with human-caused modifications subdued and blended with the natural landscape. The area is managed to accommodate a large variety of recreational uses and outdoor recreational experiences.

Alien Run Mountain Bike Trails

The area is managed to facilitate mountain biking as a high quality recreational experience.

Rattlesnake Canyon Wildlife Area

Historically, this area supported many more deer than in did when the RMP was finalized in 2003. The primary objective is to increase resident deer numbers. The area also has the potential to provide habitat to a variety of other wildlife species, such as elk, Merriam's turkey, mountain lion, and numerous avian species, if properly managed. The area is managed to support increases in potential wildlife.

San Juan County

San Juan County lies in the sparsely populated northwestern corner of New Mexico. Tribal land governed by the Navajo Nation and the

Ute Mountain Ute Indian Tribe occupies 65 percent of the county's land area, while BLM-managed land accounts for nearly 28 percent. There are 230,196 acres of private land in the county, equal to almost 7 percent of the county's land area. Land uses on private lands include a mixture of low-density rural residential; agricultural, such as alfalfa production and livestock grazing; oil and gas development; and undeveloped open space.

The San Juan County Growth Management Plan,⁴ adopted in July 2007, guides physical development activities on unincorporated lands in the county and provides local-level planning objectives for a 20-year horizon. One of the primary purposes of San Juan County's Growth Management Plan is to guide future development near urban areas. The Growth Management Plan encourages coordination with the BLM to identify lands suitable for conversion to private status, and ultimately, future development. For rural areas under federal administration, the plan defers to the BLM, noting that where suitable, the areas should continue to be used for ranching, oil and gas development, and general open space.⁵

SUIT

Land use on the SUIT Reservation is largely dispersed residential development and oil and gas production. Within and immediately adjacent to the study area as it crosses tribal land, the primary activity is oil and gas development. As the study area exits the Mesa Mountains and turns north toward Ignacio, oil and gas wells are less frequent, and land uses within and adjacent to the study area are predominately dispersed ranches and open space.

La Plata County

La Plata County is located in rural southwest Colorado. The largest urban area is Durango, with smaller population centers in Ignacio and Bayfield. Approximately 41 percent of La Plata County land is managed by federal and state agencies, with an additional 18 percent governed by the SUIT. Land use throughout the county varies. In the more-arid, less-mountainous southern half of the county, dominant land uses are agriculture and oil and gas

⁴ San Juan County 2007

⁵ San Juan County 2007

development. In the northern, more-rugged portion of the county, land is primarily managed by the US Forest Service and managed as open space.

The La Plata County Comprehensive Plan⁶ guides future land use development and planning activities for unincorporated areas of the county. La Plata County adopted the plan in 2001 largely in reaction to a significant population increase throughout the county. An overriding theme of the plan is to accommodate future development without compromising the quality of the county's natural environment. More specific district plans guide land use decision making within the county's 10 planning districts. The study area is located within the Southeast La Plata planning district. Pressure on natural resources from urban development in this district is limited.⁷ Ignacio is the largest population center in the Southeast District and is located approximately 0.75 mile from the study area. The Town of Ignacio administers land use planning and development activities consistent with the Three Mile Plan adopted in 2004. The Three Mile Plan provides general development standards for a range of land use classifications within a 3-mile radius of the town limits. Land use classifications in the Three Mile Plan underlying the study area include D4 – Large Lot Residential, E-3 – Mixed Use, B-2 – Commercial, and D1 – Large Lot Residential.⁸

D.4.2 Socioeconomics

Counties in the study area have a long history of ranching and farming. Native Americans have had an important role in the area and continue to represent an important social presence. Today, in addition to traditional industries, the economic base of the area includes substantial oil and gas development as well as retail and tourism.

Residential development within the study area largely occurs near the cities and towns located in close proximity to major water resources. The study area is mainly located in unincorporated areas

⁶ La Plata County 2001

⁷ La Plata County 2001

⁸ Town of Ignacio 2004

of San Juan and La Plata Counties. The two counties in the study area have a combined population of approximately 181,400 as of 2010. The largest cities in the region are Durango, Colorado (population 16,887 in 2010), in La Plata County, and Farmington, New Mexico (population 45,895 in 2010) in San Juan County. Population trends in the study area are shown below in Exhibit D-3, Study Area Population Trends, and population centers are shown below in Exhibit D-4, Study Area Population Centers.

Exhibit D-3
Study Area Population Trends

Location	2000	2010	Percent Population Change 2000–2010	Projected 2020	Projected Percent Population Change 2010–2020
La Plata County	43,941	51,334	16.8	66,714	30.0
Colorado	4,301,261	5,029,196	16.9	5,999,989	19.3
San Juan County	113,801	130,044	14.2	146,815	12.9
New Mexico	1,819,046	2,059,179	13.2	2,540,145	23.4

Source: Colorado State Demography Office 2012, BBER 2008, US Census 2010c

Exhibit D-4
Study Area Population Centers

State	City	Population 2010
Colorado	Durango	16,887
Colorado	Bayfield	2,300
Colorado	Ignacio	736
New Mexico	Farmington	45,895
New Mexico	Aztec	6,763
New Mexico	Bloomfield	8,112

Source: US Census Bureau 2010a

In 2010, the population density in San Juan County (23.6 persons per square mile) was higher than that of the state average in New Mexico (17.0 persons per square mile). In La Plata County, the population density was 30.3 persons per square mile. This is lower than the state of Colorado average of 48.5 persons per square mile. The study area as a whole is sparsely populated compared to the

national average of 79.6 persons per square mile.⁹ Population growth in the study area has followed trends seen in the respective states. As shown in Exhibit D-3, over the next 10 years, growth in La Plata County is expected to increase, while growth in San Juan County may slow slightly.

D.4.3 Visual Resources

D.4.3.1 BLM Visual Resource Management

BLM manages visual resources by assigning a Visual Resource Management (VRM) Class. The objective for each VRM Class describes how that area should be managed. VRM classes in the study area range from II to IV. There are no lands in the study area designated as VRM Class I, the BLM's most restrictive visual resource management class. Lands designated as VRM Class II are located in the Thomas Canyon Recreation/Wildlife Area as shown in Exhibit D-9. VRM Class II objectives are summarized below:¹⁰

- Class II objective: Retain existing landscape character. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract a casual observer's attention. Any changes must repeat the basic elements of line, form, color, and texture found in the predominant natural features of the characteristic landscape.

The majority of BLM lands in the study area are designated as VRM Class III and IV. The objectives for these visual classes are summarized below:

- Class III Objectives are to partially retain existing landscape character. The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate a casual observer's view. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
- Class IV Objective: Provide for management activities that require major modification of the landscape character. The level

⁹ US Census Bureau 2010a

¹⁰ BLM 1986

of change to the characteristic landscape can be high. Management activities may dominate the view and be the major focus of viewer attention. Every attempt should be made, however, to minimize the impact of these activities through careful location, minimal disturbance, and repetition of the basic landscape elements.

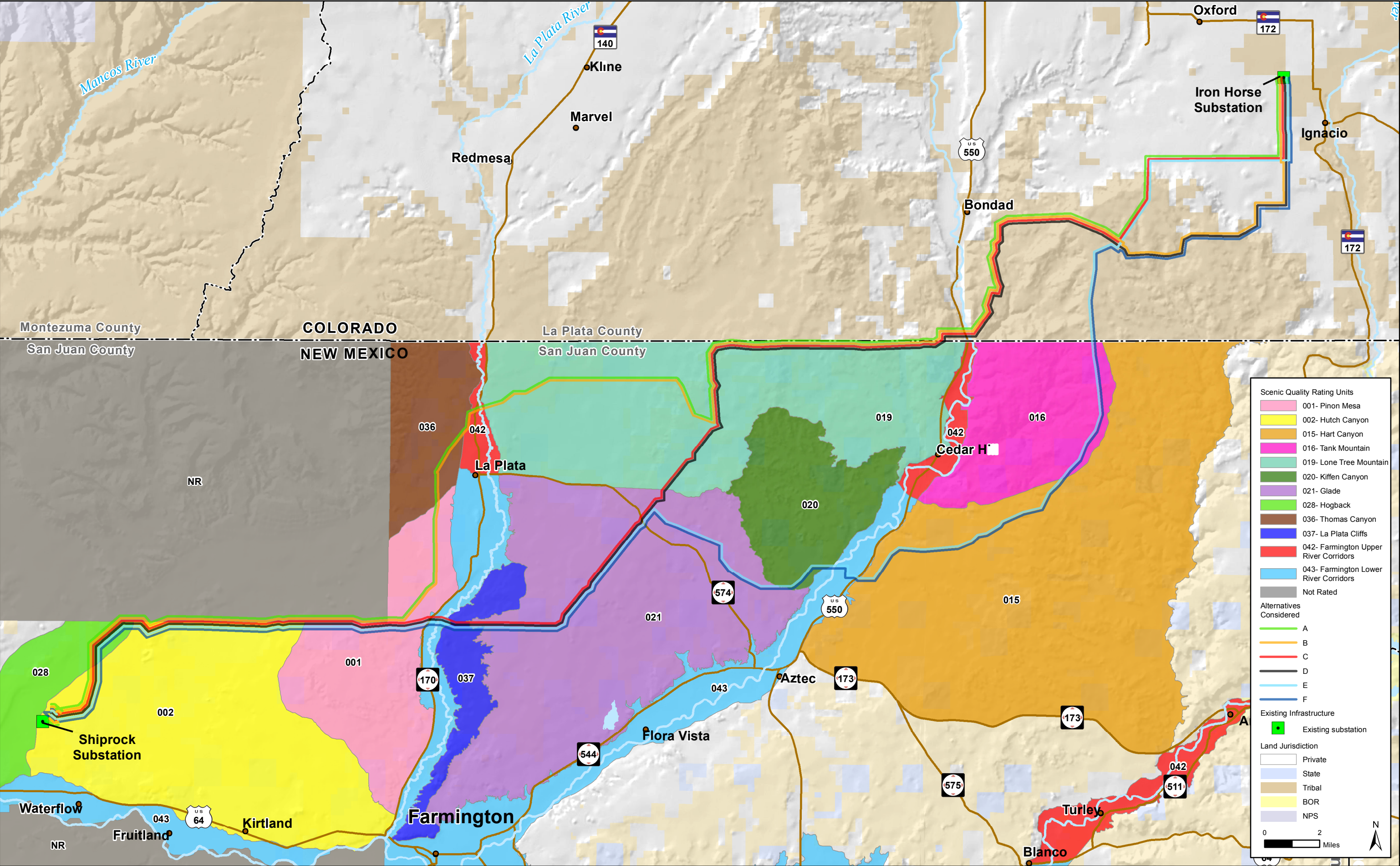
In addition, US 550 near the southern Animas River crossing is part of the Trail of the Ancients scenic byway that crosses through about 0.5 mile of the study area.

D.4.3.2 BLM Visual Resource Inventory

The BLM classifies visual resources through a Visual Resource Inventory (VRI). The VRI has three components: scenic quality, sensitivity, and distance zone. Scenic quality is a measure of the visual appeal of a tract of land. In the VRI process, BLM-managed lands are given an A, B, or C rating based on the apparent scenic quality. Scenic quality is determined by using seven key factors: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modification. Areas with the most visual appeal are rated A, while areas with the least visual appeal are rated C.

Sensitivity is a measure of the public concern for scenic quality. During the sensitivity rating, public lands are assigned high, medium, or low sensitivity by analyzing six indicators of public concern: type of user, amount of use, public interest, adjacent land uses, special areas, and other factors.

The distance zone analysis is conducted to determine the relative visibility from travel points or observation points. The distance zone for this area is foreground/middleground meaning the area can be seen from travel routes of observation points within a distance of 3 to 5 miles. Descriptions of the scenic quality, sensitivity, distance zone and the resulting VRI Class for the study area are provided below. The areas discussed are shown in Exhibit D-5, BLM Visual Resource Areas. In general, scenic quality in the study area is rated as B or C depending on the location. Sensitivity in the study area is mostly rated as medium or low with the exception of the Hogback, Thomas Canyon, La Plata Cliffs, and the Farmington Upper River Corridors shown in Exhibit D-5.



VRI ratings in the study area are mostly rated as VRI Class III or IV, with the exception of the Hogback, Thomas Canyon, La Plata Cliffs, and Farmington Upper River Corridors, which are rated a VRI Class II.

001: Pinon Mesa

Pinon Mesa, an elongated bluff with steep cliffs, serves as the visual focal point in this area. The mesa is comprised of dramatic, eroded cliffs and light brown to buff colored rock outcrops. The vertical cliffs with their diagonal talus slopes provide contrast to the overall horizontal landscape.

The dominant vegetation is dark green pinon and juniper which is patchy and scattered on the talus slopes, but forms a continuous mass on the top of the mesa. Grey-green grasses and shrubs comprise the remainder of the vegetation.

- Scenic Quality: B
- Sensitivity: Medium
- VRI Class: III

002: Hutch Canyon

This area contained rolling hills incised by draws in addition to eroded hills and low, table mesas. The primarily horizontal landscape is muted gray, buff, and brown in color. The vegetation is comprised of green juniper with a grass understory.

- Scenic Quality: B
- Sensitivity: Low
- VRI Class: IV

015: Hart Canyon

This area contains rolling hills, distinct low buttes, and distinct drainages. Horizontal, banded rock outcrops rise from the otherwise horizontal landscape. The continuous pinon/juniper woodland provides screening for oil and gas facilities. Colors in the landscape vary from the browns and beiges of the soils to the greens of the vegetation.

- Scenic Quality: B
- Sensitivity: Low
- VRI Class: IV

016: Tank Mountain

This area contains Tank Mountain, Mount Nebo, and the Ditch Canyon complex. The canyon complex contains dramatic steep canyons with massive rock outcrops, steep canyon walls, and a sinuous dry wash in the bottom. Soils vary in color from brown to gray to purple. Vegetation includes green Douglas fir and Ponderosa pine trees. Oil and gas development is screened.

- Scenic Quality: B
- Sensitivity: Medium
- VRI Class: III

019: Lone Tree Mountain

The area is characterized by rolling hills, open sagebrush valleys, and gentle slopes. A prominent, but not dramatic, mountain is the focal point for the area. The area is mostly covered by pinon/juniper woodland and sagebrush, but a few areas are devoid of vegetation. Colors vary from the browns and beiges of the soils to the greens and grays of the vegetation.

- Scenic Quality: C
- Sensitivity: Low
- VRI Class: IV

020: Kiffen Canyon

This area is characterized by an eroded, semi-badland complex that encompasses the Bohanan, Tucker, and Kiffen Canyons. There is a fairly rugged, Medium relief with exposed slopes and rock outcrops. The landform is comprised of overlapping pyramids; elongated, flat canyon bottoms, steep slopes, and some vertical cliffs with strong horizontal banding and diagonal lines. The vegetation is mostly comprised of pinon/juniper. Colors vary from the browns, grays, beiges, purples, and maroons of the soils to the greens of the vegetation.

- Scenic Quality: B
- Sensitivity: Low
- VRI Class: IV

021: Glade

The area is comprised of a broad valley with rolling hills to the east and low bluffs to the west. Vegetation is low, continuous sage. Colors vary from the beiges and grays of the soil to the greens and grays of the vegetation. Power lines and well sites are noticeable and add vertical lines to the otherwise horizontal landscape.

- Scenic Quality: C
- Sensitivity: Low
- VRI Class: IV

028: Hogback

This area is characterized by a long series of overlapping triangular rock features and steep rock outcrops. The horizontal contains complex, undulating diagonal lines. Colors vary from browns and beiges of the soil to the greens of the thin shrub and grass understory.

- Scenic Quality: B
- Sensitivity: High
- VRI Class: II

036: Thomas Canyon

This area is characterized by a long, rounded ridge aligned north to south and dissected by narrow canyons aligned east to west. The browns and grays of the soils contrast with the greens of the continuous pinon/juniper woodland.

- Scenic Quality: C
- Sensitivity: High
- VRI Class: II

037: La Plata Cliffs

This area is characterized by rugged cliffs, deep drainages, steep eroded slopes, and a narrow alluvial fan. Vegetation consists of pinon/juniper in various shades of green, contrasting with the

browns, beiges, oranges, and grays of the soils. Evidence of development is present, including oil tanks and power poles.

- Scenic Quality: B
- Sensitivity: High
- VRI Class: II

042: Farmington Upper River Corridors

The upper river corridors of the FFO retain a scenic, pastoral appearance. The level floodplain slopes gently away from the rivers. Vegetation includes the bold forms of the trees and low vegetation in the fields. Seasonal variations change colors for greens to browns to grays. Human activity is noticeable, but does not dominate the landscape.

- Scenic Quality: B
- Sensitivity: High
- VRI Class: II

043: Farmington Lower River Corridors

The low, flat alluvial valleys contain substantial rural residential and commercial development. A diverse mix of vegetation includes native shrubs and grasses and agriculture. Colors vary from browns to greens to grays.

- Scenic Quality: B
- Sensitivity: Low
- VRI Class: IV

D.4.4 Transportation

A network of federal highways, state highways, county roads, private roads, BLM, SUIT, and other agency roads serves the study area. There are a range of single-lane, two-lane, and four-lane roads with varying degrees of improvements and a broad range of users. Three north-south oriented highways occur within the study area as shown in Exhibit D-1: New Mexico State Highway 170 (NM 170)/Colorado State Highway 140; US 550; and New Mexico State Highway 511/Colorado State Highway 172. US 550 between

Bloomfield, New Mexico, and the New Mexico and Colorado state line is a scenic byway. Transmission line routing took into consideration the visual and recreational implications of routing the transmission line in proximity to a scenic byway. In addition to US and state highways, there are several county and local roads that occur throughout the study area.

The BLM has jurisdiction over many miles of existing roads in the study area. In general they are partially improved, single-lane native-dirt-surface roads or two-track roads with no improvements. The primary function of these roads is to provide access for natural gas operators, electric utilities, and recreationalists to BLM-managed lands. Most of the roads parallel existing infrastructure such as the Western Area Power Administration's 345 kV transmission line, the City of Farmington's 115 kV transmission line, and the various natural gas pipelines that cross the area.

Similarly, roads on New Mexico State Trust Lands are generally single lane and unimproved with native dirt surfaces. In general, the users are limited to ranchers, natural gas providers, electric utilities, and recreationalists.

The SUT, and the users of its lands (mostly natural gas operators), have an extensive and well-defined network of roads. In general, SUT roads are 20 to 30 feet wide and have gravel or compacted, native dirt surfaces. Use on SUT roads is restricted to members of the SUT and to users who possess a valid crossing permit issued by the SUT.

Roads on private lands in the study area are generally associated with ranching or natural gas operations and consist of partially improved, single-lane native-dirt-surface roads or two-track roads with no improvements.

D.4.5 Geology and Soils

D.4.5.1 Geology

The study area is located within the San Juan Basin, which is the dominant structural feature within the four corners area and the east-central Colorado Plateau. It covers more than 26,000 square miles of New Mexico and Colorado. The portion of the study area

that begins near Shiprock is located within a central, bowl-like depression. It is composed of over 2.5 miles of layers of sedimentary rocks created from deposition over the past two million years. The boundaries of the basin are characterized by uplifts that brought older, igneous formations to the surface. The northern edge typically has a steep slope leading from the uplift to the central basin.

The focus of the geologic review in the study areas for this analysis was on slope, since that is a primary factor for engineering transmission lines and their supporting infrastructure. Between the Shiprock Substation and the Kiffen Canyon Substation area, slopes are generally 5 to 10 percent, with some areas of 10 to 20 percent slopes. The slopes are steeper and more varied east of the proposed Kiffen Canyon Substation. Between the Colorado-New Mexico border and Ignacio, where Alternatives A through D cross the Animas River, there are slopes greater than 20 percent.

D.4.5.2 Soils

For purposes of this analysis, soil erodibility was considered, since that is a primary factor for engineering transmission lines and their supporting infrastructure. Near the Shiprock Substation, the soil is a mix of low and highly erodible soil. The soil erodibility is primarily low to moderate in the vicinity of NM 170. East of NM 170, in the vicinity of the Glade Run Recreation Area to the New Mexico-Colorado border there is a large area of highly erodible soil. All of the alternatives would cross this area for the Kiffen Canyon Substation. From the Colorado boarder north to the Iron Horse Substation, the soil erodibility in the study area is low to moderate.

D.4.6 Minerals

Numerous oil and gas wells occur throughout the entirety of the study area, and allowing an adequate distance between oil and gas wells and the transmission line routes was taken into consideration throughout the routing process.

In addition, there are surface mines in the study area. One of the mines is located near the existing Shiprock Substation. This mine is a large coal mining and power plant operation, operated by BHP

Billiton. This coal mine supplies coal to the San Juan Generation Station located approximately 2.5 miles east of the Shiprock Substation. Although BHP Billiton no longer conducts any surface mining operations at this mine, much of the area directly east of the San Juan Generation Station is still used for reclamation and disposal activities.

Coal mines are located near the state line between New Mexico and Colorado near the northern section of the La Plata River.

D.4.7 Water Resources

Northwestern New Mexico and southwestern Colorado are on the west slope of the continental divide. The San Juan River drainage basin dominates the landscape in northwestern San Juan County, New Mexico. River valleys and washes, mesas, and undulating uplands punctuate the landscape along the New Mexico and Colorado border. Riparian areas exist along drainage areas, especially adjacent to the San Juan, La Plata, and Animas Rivers.

Major water resources identified within the study area include the La Plata River, which runs parallel to NM 170 and Colorado State Highway 140; the Animas River, which runs parallel to US 550, the Los Pinos River, which traverses the far eastern side of the study area; and the San Juan River, which runs parallel to US 64. By necessity, the transmission line would cross both the La Plata and Animas rivers. Four large surface water bodies occur within the study area: Morgan Lake, Beeline Reservoir, Navajo Reservoir in New Mexico, and Lake Nighthorse in Colorado. Other water resources within the study area include springs, streams, ephemeral drainages, ditches, canals, and wetlands.

D.4.8 Vegetation

In general, the study area can be divided into two distinct portions, southwestern and northeastern, with differing landscapes. The southwestern portion of the study area consists of shrub/scrub and grassland/herbaceous land cover. Topography within the southwestern portion of the study area consists of mostly flat land with some hills, mesas, and small canyons occurring sporadically. The northeastern portion of the study area consists primarily of evergreen forest with shrub/scrub and pasture/hay land cover types

occurring sporadically. The topography throughout the majority of the northeastern portion of the study area can be generally described as having steeper terrain with many hills and valleys.

D.4.9 Biological Resources

Wildlife habitat within the study area was identified to understand where potentially sensitive areas are found. Appendix B, Resource Maps, in the Route Refinement Report (Appendix C) identify potentially sensitive habitat within the study area, including bear, elk, mule deer, and prairie dog habitat; raptor habitat; designated critical habitat for pikeminnow and razorback suckers; potential habitat for the aztec gilia and Brack's cactus; and mountain lion-human conflict areas. Threatened and endangered species habitat was also identified within the study area, but occurs infrequently throughout the study area. In addition, Section D.4.1.2, Land Use Plans and Policies, describes SDAs that are managed for their wildlife and habitat attributes.

D.4.10 Cultural Resources

The study area is located within the archaeologically rich San Juan Basin of northwest New Mexico. Humans have occupied northwestern New Mexico and southwestern Colorado for at least the past 10,000 years, leaving behind diverse cultural resources. The area has been the setting for the development of early farming villages nearly 2,000 years ago, the expansion of the regional system associated with Chaco Canyon roughly 900 to 1,000 years ago, the formation of large Mesa Verde period pueblos in the following centuries, the establishment of the Navajo homeland of Dinétah during the protohistoric period, Spanish/Mexican exploration, and the historic expansion of ranching and the oil and gas industry in the twentieth century. Because of the rich cultural history of the area, cultural resources are prevalent throughout the entire study area, though many of these resources may not be recorded.

In general, the history of the San Juan Basin can be divided into five major periods: PaleoIndian (ca. 10000 B.C. to 5500 B.C.), Archaic (ca. 5500 B.C. to A.D. 400), Basketmaker II-III and Pueblo I-IV periods (aka Anasazi; A.D. 1-1540), and the historic (A.D. 1540 to present), which includes Native American as well as later Hispanic

and Euro-American settlers. Detailed descriptions of these various periods are provided in the BLM FFO Final EIS¹¹ and are not reiterated here.

Cultural sites vary considerably and can include, but are not limited to, simple artifact scatters, domiciles of various types with a myriad of associated features, rock art and inscriptions, ceremonial/religious features, and roads and trails. Traditional Cultural Properties are a separate class of cultural resources and are places that have cultural values that transcend, for instance, the values of scientific importance that are normally ascribed to cultural resources such as archaeological sites and may or may not coincide with archaeological sites.¹² Cultural resources can be significant in national, regional, or local history, architecture, archaeology, engineering, or culture, and can also include natural features significant to extant communities or peoples.

D.5 Environmental Effects

Exhibit D-6, Alternatives Overview, compares the length of each alternative and the total length adjacent to existing disturbance and other similar linear features. As shown in Exhibit D-6, the length of the alternatives ranges from 64.5 miles to 68.5 miles. Alternative C is the shortest route, followed by Alternatives D, E, F, A, and B.

Alternative D would follow the greatest total length of existing linear disturbance, followed by Alternatives B, C, A, F, and E. The benefit of building the transmission line near other linear disturbance areas is that similar uses would be co-located, which often minimizes environmental effects to the greatest degree since it means that the transmission line and supporting facilities would be built in or near areas that are already disturbed. Furthermore, locating the transmission line near existing roads limits the number of access roads that would need to be constructed to build and maintain the transmission line. Locating the transmission line adjacent to existing

¹¹ BLM 2003

¹² Parker and King 1998

transmission lines helps to minimize effects to landowners and viewsheds because similar structures are already located in these areas. There are a number of existing transmission lines in the study area, and Alternatives C and D would parallel existing transmission line infrastructure for the greatest length.

Specifically, Alternatives C and D would parallel existing transmission lines for 28.48 miles as compared to 24.49 miles for Alternatives E and F, and 15.99 miles for Alternatives A and B.

Exhibit D-6

Alternatives Overview

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Design Features						
Alternative length (miles)	67.71	68.59	64.52	65.41	66.76	67.65
Length Following Existing Linear Features (miles)						
Length adjacent to existing transmission lines	15.99	15.99	28.48	28.48	24.49	24.49
Length adjacent to pipelines	14.68	19.28	5.52	10.12	5.29	9.89
Length adjacent to existing roads	17.13	14.23	14.43	11.63	13.38	9.89
Total length adjacent to existing linear disturbance ¹	42.93	44.48	44.22	45.76	39.13	40.67

¹ The total length adjacent to existing linear disturbance is less than adding the three categories above it in order to account for areas of overlap between categories.

D.5.1 Land Ownership and Use

D.5.1.1 Land Ownership

The distribution of land ownership that would be affected by the proposed transmission line varies for the six alternatives analyzed and is shown below in Exhibit D-7, Land Ownership Comparison. Each of the six alternatives would build the proposed transmission line across private lands and lands that are managed by the BLM, SUIT, and state of New Mexico.

Exhibit D-7**Land Ownership Comparison**

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length crossing BLM-managed land (miles)	22.61	22.61	25.88	25.88	35.61	35.60
Length crossing Southern Ute Indian tribal trust land (miles)	13.09	14.46	13.09	14.46	7.03	8.41
Length crossing state of New Mexico- owned land (miles)	3.02	3.02	3.95	3.95	3.78	3.78
Length crossing private land (miles)	28.99	28.50	21.59	21.12	20.34	19.86

D.5.1.2 Land Use

Land use considerations included the length that the transmission line that would cross BLM-managed SDAs and the number of communication towers located within 0.25 mile of the centerline as shown below in Exhibit D-8, Land Use Effects Comparison.

Exhibit D-8**Land Use Effects Comparison**

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length crossing BLM-managed SDAs or ACECs (miles)	16.66	16.66	11.48	11.48	26.29	26.29
Number of communication towers within 0.25 mile of centerline	22	22	35	35	27	27

SDAs and ACECs Crossed

There are a total of eight SDAs and ACECs located in the study area as shown in Exhibit D-9, BLM Special Designated Areas.

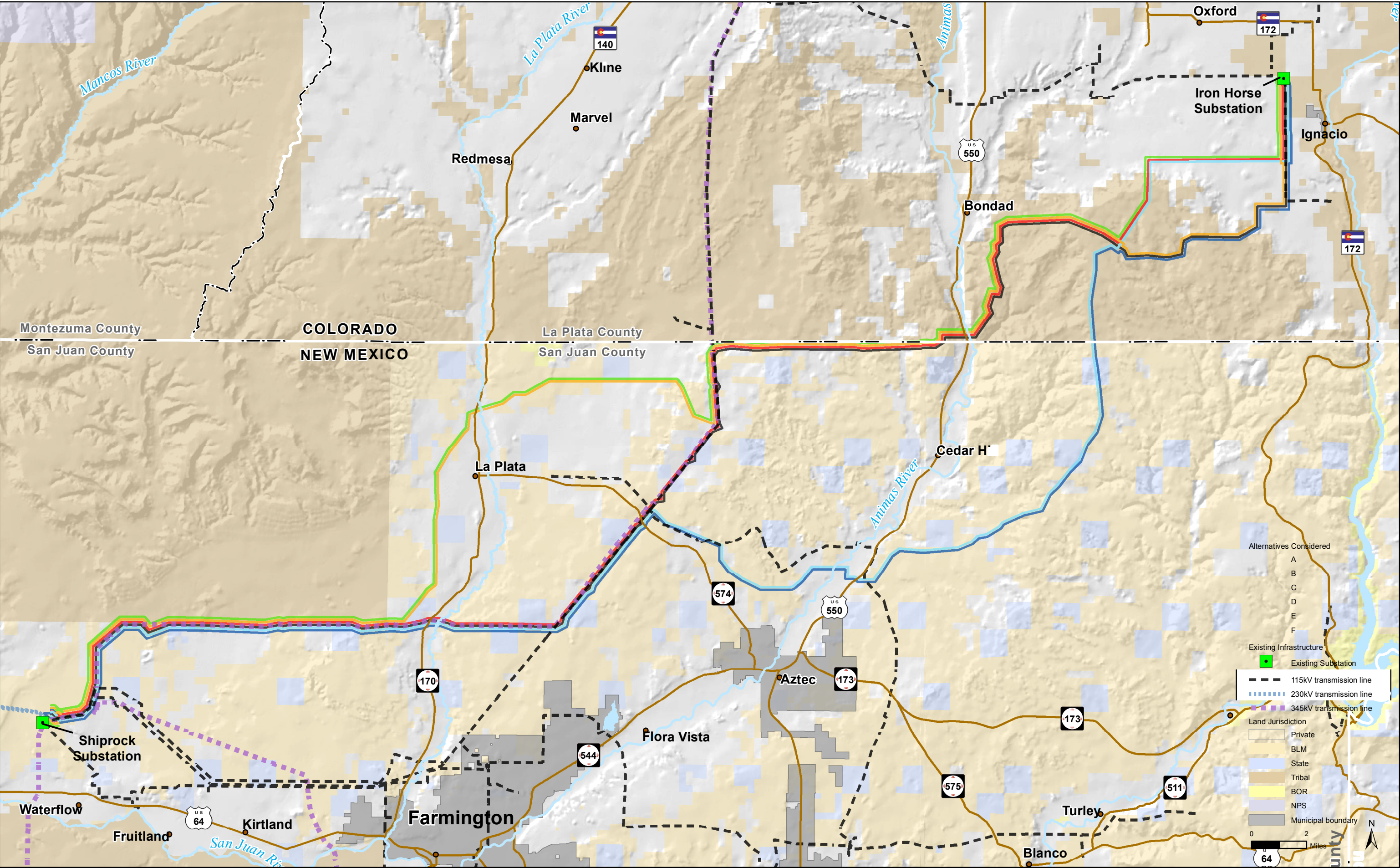
Alternatives C and D would cross the least area of land that is managed by the BLM as SDAs. Alternatives C and D would cross the Pinon Mesa and Glade Run Recreation Areas as well as a small portion of the Hogback ACEC, which is managed as a critical area to protect rare plant habitat. The SDAs that would be affected by Alternatives C and D are areas that currently have similar transmission line infrastructure including transmission lines, substations, and access roads.

Exhibit D-10, Existing Transmission Lines in the Study Area, shows where these lines are located. In the Hogback ACEC near the Shiprock Substation, there are several transmission lines, including a 345 kV line that are located in the ACEC near the San Juan Power Plant. In addition, this area contains supporting infrastructure including the Shiprock Substation and associated access roads. In the Pinon Mesa Recreation Area, there is an existing 345 kV line and supporting access roads. Finally, in the Glade Run Recreation Area, there is an existing 345 kV transmission line, a 115 kV transmission line, a substation, and supporting access roads. Alternatives C and D would place similar infrastructure within the SDAs and ACECs to what is found in the existing landscape.

Alternatives A and B would cross an additional 5.18 miles of SDAs as compared to Alternatives C and D. SDAs that would be crossed by Alternatives A and B would include the Hogback ACEC, the Thomas Canyon Recreation/Wildlife Area, and the East La Plata Wildlife Area. Effects in the Hogback ACEC would be similar to those discussed above for Alternatives C and D and would be similar in nature to existing land uses in the Hogback ACEC. In the Thomas Canyon Recreation/Wildlife Area and the East La Plata Wildlife Area, the transmission line and associated supporting infrastructure would not be consistent with existing land uses in the area. Currently there are no existing transmission lines or supporting infrastructure in these areas as shown in Exhibit D-10. Adding a transmission line in this area would affect views, recreational users, and could result in habitat fragmentation. In the Thomas Canyon Recreation/Wildlife Area and the East La Plata Wildlife Area, the transmission line and associated supporting infrastructure would not be consistent with existing land uses in the area. In the Thomas Canyon Recreation/Wildlife Area a transmission line would not be consistent with the BLM's management objectives, which include managing the area for the optimal combination of primitive recreation opportunities and wildlife protection.¹³ Similarly for the East La Plata Wildlife Area, the transmission line and associated supporting infrastructure would not be consistent with the BLM's management objectives of managing the area to protect and preserve big game habitat.¹⁴

¹³ BLM 2003

¹⁴ BLM 2003



Source: GIS BLM 2012, GIS CDOT and SJC 2012, GIS Tri-State 2013, GIS Tetra Tech 2010

Exhibit D-10 Existing Transmission Lines in the Study Area

Alternatives E and F would cross the most amount of land managed as SDAs, an additional 14.81 miles as compared with Alternatives C and D. In addition to effects described above for Alternatives C and D (Hogback ACEC, Pinon Mesa Recreation Area, and Glade Run Recreation Area), Alternatives E and F would cross the Rattlesnake Canyon Wildlife Area. There are no existing transmission lines and supporting infrastructure within most of this SDA as shown in Exhibit D-10. In this area, the transmission line and associated supporting infrastructure would represent a new use that would not be consistent with the BLM's land use objectives for the Rattlesnake Canyon Wildlife Area to support increases in potential wildlife areas.

Communications Facilities

As shown above in Exhibit D-8, Alternatives A and B would be located within 0.25 mile of 22 communications towers, Alternatives E and F would be located within 0.25 mile of 27 communications towers, and Alternatives C and D would be located within 0.25 mile of 35 communication towers.

Communication facilities are taken into account when designing transmission lines to avoid interference. In the case of the six alternatives evaluated, the number of communication facilities would be taken into account when designing the line to avoid effects.

D.5.2 Socioeconomics

Exhibit D-11, Socioeconomic Effects Comparison, compares the number of residences located in close proximity to each of the alternatives as well as the length and number of subdivisions that would be affected. For all six alternatives, no residences are located less than 150 feet from the proposed transmission line routes.

Exhibit D-11

Socioeconomic Effects Comparison

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length crossing subdivisions (miles)	0.52	0.41	0.12	0	0.12	0
Number of subdivisions crossed by centerline	2	1	1	0	1	0
Residences within 150–300 feet of centerline	5	1	5	1	4	0
Total residences within 0.25 mile of centerline	61	35	64	38	132	106

Alternative A would cross two subdivisions; one is located east of the La Plata River in New Mexico near Route Segment 26 (route segments are shown on Exhibit D-2), and the other is located along Route Segment 46 in Colorado. These areas currently do not have transmission lines in the area as shown previously in Exhibit D-10, so placing a new transmission line could affect views for people living in these subdivisions and residences. Several residents located in Route Segments 15, 21, and 26 were opposed to the transmission line being located in these areas due to possible effects to properties, views, and public health.¹⁵

Alternative B would cross one subdivision located east of the La Plata River in New Mexico but would be within 0.25 mile of the fewest number of residences of the alternatives analyzed. Several residents located in Route Segments 15, 21, and 26 were opposed to the transmission line being located in these areas due to possible effects to properties, views, and public health.¹⁶

Alternative C would cross one subdivision located along Route Segment 46 in Colorado. Alternative D would not cross any subdivisions.

Alternative E would cross one subdivision in Colorado but would be located within 0.25 mile of 132 residences, the most of any alternative analyzed. Alternative F would not cross any subdivisions but would be located within 0.25 mile of 106 residences, which is substantially more than Alternatives A through D. There are 77 residences located on both sides of the Animas River in the vicinity of Route Segments 29 and 53. Currently there is not a transmission line in these areas, so placing a transmission line in these areas could affect views in these areas. Many comments were received during EIS scoping¹⁷ stating concerns with possible residential effects along Route Segments 24, 29, 53, and 55. Residents near the southern Animas River crossing were strongly opposed to the use of Route Segment 53 because it crosses active agricultural land and would be visible to many

¹⁵ BLM 2011

¹⁶ BLM 2011

¹⁷ BLM 2011

residents northeast of Aztec, New Mexico. In addition, residents were concerned about property effects and possible health effects from electromagnetic fields. Many residents in this area stated they prefer a route that uses a northern Animas River crossing in Colorado. The BLM did not receive any comments opposing the northern Animas River crossing.

Of all categories considered, Alternative D would affect residences to a lesser degree than the other alternatives analyze because it would parallel similar transmission line infrastructure for the greatest distance, not affect any subdivisions, and has 38 residences located within 0.25 mile. Even though Alternative B would be located next the fewest number of residences (35 as compared to 38 for Alternative D), it would introduce a transmission line to an area where there currently is not a transmission line (Route Segments 15, 21, 26, and 51) and it would cross a subdivision. Therefore, effects to residences would be greater with Alternative B than with D. Alternative F is the only other alternative that would not cross a subdivision; however, there are numerous residences located in the Animas River Valley and Alternatives E and F would place the transmission line in a location where one does currently not exist along Route Segments 29, 53, and 55 shown in Exhibit D-2.

D.5.3 Visual Resources

Exhibit D-12, Visual Resources Effects Comparison, compares effects to visual resources. There are no VRM Class I lands in the study area, but there are VRM Class II lands.

Exhibit D-12

Visual Resources Effects Comparison

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length crossing Class II VRM (miles)	1.75	1.75	0	0	0	0
Length paralleling (within 0.25 mile) scenic byways (miles)	0	0	0	0	0.47	0.47
Number of scenic byway crossings	0	0	0	0	1	1

As shown in Exhibit D-12, Alternatives A and B would cross approximately 1.75 miles of VRM Class II designated lands.

Alternatives C, D, E, and F would not cross any VRM Class II designated lands.

Alternatives A and B would cross through 1.75 miles of VRM Class II designated lands located in the Thomas Canyon area just west of NM 170 and the La Plata River (see Exhibit D-5). If the transmission line were built in this area it would introduce a transmission line and associated structures in an area where these visual features do not exist. Adding a transmission line in this area would not be consistent with the BLM's VRM Class II Objectives, which require retaining the existing character of the landscape. In addition, these alternatives would add a transmission line in an area where one currently does not exist along Route Segments 15, 21, 26, and 51 (route segments are shown in Exhibit D-2). This would affect views within the existing landscape, particularly for residences located along this route and in the subdivision located in Route Segment 26.

Alternatives E and F would add a transmission line in an area where one currently does not exist along Route Segments 29, 53, and 55. This would affect views within the existing landscape, where 77 residences are located in the vicinity of Route Segments 29 and 53. In addition, Alternatives E and F would cross approximately 0.47 mile of portion of a scenic byway along US 550 near the southern Animas River crossing.

Overall, Alternatives C and D would have the fewest effects to views than the other alternatives analyzed, since so much of the transmission line would be located in areas with existing transmission lines and in areas where there are fewer residential uses. Alternative C would have greater visual effects than Alternative D, since it would cross one subdivision located along Route Segment 46 and affect 29 more residences than Alternative D.

D.5.4 Transportation

Exhibit D-13, Transportation Effects Comparison, compares the effects to transportation. Alternative A would parallel existing roadways for the greatest length. For each of the alternatives, the type of road the transmission line would be adjacent to are

primarily county or local roads. Alternative D would have the fewest number of road crossings.

The transmission line alignment would cross a railroad line [and run parallel to the tracks for less than a tenth of a mile for Alternatives A through D. Alternatives A, C, and E would all pass within 1 mile of the Durango-La Plata County Airport and the transmission line would be required to meet FAA regulations. Overall, none of the construction and maintenance activities for Alternatives A through F is expected to noticeably affect existing transportation infrastructure.

Exhibit D-13**Transportation Effects Comparison**

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length adjacent to existing roads (miles)	17.13	14.23	14.43	11.63	13.38	9.89
<i>Length adjacent to US highways (miles)</i>	<i>0.07</i>	<i>0.07</i>	<i>0.07</i>	<i>0.07</i>	<i>0.07</i>	<i>0.07</i>
<i>Length adjacent to state highways (miles)</i>	<i>0.07</i>	<i>0.07</i>	<i>0.15</i>	<i>0.15</i>	<i>0.15</i>	<i>0.15</i>
<i>Length adjacent to county or local roads (miles)</i>	<i>16.99</i>	<i>14.09</i>	<i>14.31</i>	<i>11.41</i>	<i>13.16</i>	<i>10.26</i>
Number of road crossings	107	101	98	92	100	94
Number of railroad crossings	1	1	1	1	0	0
Length adjacent to railroads (miles)	0.07	0.07	0.07	0.07	0	0
Number of public airports or heliports within 1 mile of centerline	1	0	1	0	1	0

D.5.5 Geology and Soils

Exhibit D-14, Geology and Soils Effects Comparison, compares effects to geology and soils. Approximately 90 percent of the slopes in Alternatives E and F, and 82 to 85 percent of the slopes in Alternatives A, B, C, and D would be less than 10 percent. Because of the location of the Animas River crossing, Alternatives E and F cross the least amount of areas with steep slopes over 25 percent and are located on the most amount of soil with low erosion potential. Alternatives C and D cross more soil high erosion potential than the other alternatives. Overall, the slopes and soil

conditions for Alternative E and F are the most favorable, though for any of the alternatives, possible concerns related to slope stability and erosional soils can be mitigated through the design process.

Exhibit D-14**Geology and Soils Effects Comparison**

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length crossing slope <10% (miles)	55.35	54.57	53.15	52.36	60.13	59.35
Length crossing slope 10–25% (miles)	7.80	9.06	7.06	8.31	4.44	5.70
Length crossing slope >25% (miles)	2.47	2.77	2.3	2.6	.96	1.26
Length crossing low soil erosion potential (miles)	26.66	27.11	26.39	26.85	34.25	34.71
Length crossing moderate soil erosion potential (miles)	19.41	19.84	14.63	15.07	16.35	16.79
Length crossing high soil erosion potential (miles)	18.43	18.43	20.27	20.27	14.97	14.97

D.5.6 Minerals

Exhibit D-15, Minerals Effects Comparison, compares effects to minerals. The number of oil and gas wells in the vicinity is similar for all of the alternatives. Alternatives C, D, E, and F would all cross one mine. Alternatives A and B cross five surface mines and the distance to cross these mines double the length of the other alternatives.

Exhibit D-15**Minerals Effects Comparison**

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Number of oil or gas wells within 250 feet of centerline	15	15	15	15	14	14
Length crossing surface mines (miles)	4.68	4.68	2.31	2.31	2.31	2.31
Number of surface mines crossed by centerline	5	5	1	1	1	1

Alternatives E and F would largely follow the Arkansas Loop Road and pipeline corridor located in Route Segment 55. Locating the transmission line outside of Route Segment 55 is preferred, since in

this case it would be difficult to locate a transmission line directly adjacent to the existing pipeline corridor due to the congestion of existing oil and gas infrastructure. Spacing constraints with existing gas wells and other infrastructure would require the route to be located as much as 0.5 mile away from the established pipeline corridor, resulting in additional disturbance and minimizing the benefits of co-locating energy development and infrastructure. Overall, Alternatives C and D would have the fewest effects to mineral resources.

D.5.7 Water Resources and Wetlands

Exhibit D-16, Water Resources and Wetlands Effects Comparison, compares various water resources and wetland attributes for the six alternatives. One important difference between the alternatives is that Alternatives A, B, C, and D would cross the Animas River using the northern Animas River crossing and Alternatives E and F would cross the Animas River with the southern Animas River crossing. The northern Animas River crossing would cross the river at a location where topography and river conditions allow for a single-span crossing that would be built entirely out of sensitive floodplain and riparian areas. In contrast, the southern Animas River crossing would cross the river in a location where the topography is relatively flat and the river is wide, which would require placing multiple structures in the river's sensitive floodplain and riparian areas. This difference is substantial in terms of minimizing effects to river and floodplain areas and fish and wildlife habitat during both construction and maintenance.

Exhibit D-16

Water Resources and Wetlands Effects Comparison

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length crossing open water (miles)	0	0	0	0	0.05	0.05
Number perennial, intermittent, or ephemeral stream or river crossings	90	92	101	103	106	108
Number of canal or ditch crossings	10	10	4	4	4	4
Length crossing NWI wetlands (miles)	0.04	0.04	0.04	0.04	0.15	0.15
Length crossing woody wetlands (miles)	0.43	0.41	0.28	0.26	0.58	0.55

All of the alternatives would cross mapped water bodies. For all alternatives most of the mapped water bodies in the study area are ephemeral, stormwater-fed drainages and not perennial streams. Alternatives A and B would cross the fewest number of mapped water bodies, followed by Alternatives C, D, E, and F, respectively. Alternatives A and B would cross 10 canals or ditches as compared to Alternatives C, D, E, and F. For any of the alternatives, transmission line structures, substations, and access roads would be designed and built outside of these drainages to the extent practicable to minimize possible effects related to altering drainage pathways or increasing sediment loads.

All six alternatives would cross wetland areas. Where practicable, the project would be designed and built to span wetland areas to avoid effects to these sensitive resources. In most cases, it is expected that the route could be designed to avoid these features. Alternatives E and F would cross the most area of wetlands listed on National Wetlands Inventory (NWI) maps, followed by alternatives A, B, C, and D, which would cross 0.04 acre of NWI-documented wetlands.

For woody wetlands, Alternative E would cross the longest area of wetlands, followed by Alternatives F, A, B, C, and D, respectively. Alternatives E and F would cross more wetland area in the vicinity of the southern Animas River crossing, where transmission line structures would be required in riparian and floodplain areas. Overall, Alternative D is expected affect the least amount of wetland area as compared to the other alternatives.

D.5.8 Vegetation

Vegetation and land cover types were mapped in the study area to determine the land cover types that would be affected by the alternatives. In general, developed land, barren land, shrubland, grassland, and agricultural land, generally have land uses and vegetation that is more compatible with transmission line infrastructure and requires less vegetation clearing. Conversely, forested areas with tall trees are less compatible and better to avoid or minimize where feasible because these areas require tree cutting and vegetation removal, which has a more negative effect on natural resources and habitats.

Exhibit D-17, Vegetation Effects Comparison – Vegetation More Likely to be Compatible with Transmission Lines, shows vegetation types that are more likely to be compatible with transmission lines, and Exhibit D-18, Vegetation Effects Comparison – Vegetation Less Likely to be Compatible with Transmission Lines, shows vegetation types that are less likely to be compatible with transmission lines. Exhibit D-19, Vegetation Effects – Total Length Affected, shows the total length of vegetation that could be affected by the alternatives.

Exhibit D-17

Vegetation Effects Comparison – Vegetation More Likely to be Compatible with Transmission Lines

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length crossing developed land (miles)	1.6	0.8	1.38	0.59	1.41	0.62
Length crossing barren land (miles)	1.58	1.58	0.56	0.56	0.56	0.56
Length crossing shrub/scrub (miles)	41.59	40.60	39.99	38.99	43.42	42.42
Length crossing grassland/herbaceous (miles)	7.72	7.80	7.54	7.62	11.64	11.72
Length crossing pasture/hay (miles)	0.86	1.96	1.12	2.22	1.62	2.73
Total Length	53.35	52.74	50.59	49.98	58.65	58.05
Percent of Route with Compatible Land Cover Types	79%	77%	78%	76%	88%	86%

Exhibit D-18

Vegetation Effects Comparison – Vegetation Less Likely to be Compatible with Transmission Lines

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length crossing deciduous forest (miles)	0.53	0.63	0.53	0.63	0.49	0.59
Length crossing evergreen forest (miles)	13.30	14.72	13.12	14.54	6.64	8.06
Total Length	13.83	15.35	13.65	15.17	7.13	8.65
Percent of Route with Less Compatible Land Cover Types	20%	22%	20%	22%	10%	12%

Exhibit D-19

Vegetation Effects – Total Length Affected¹

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Total Length Affected	67.18	68.09	64.24	65.15	65.78	66.70

¹ The total length affected is slightly lower than what is shown in Exhibit D-6 due to areas of overlap and rounding.

As shown in the exhibits above, Alternative C would affect the least amount of vegetation, followed by Alternatives D, E, F, A, and B.

On a percentage basis, Alternatives E and F would cross an area that would have the most area that is compatible with transmission lines and would cross the smallest area with vegetation types that are less compatible. Alternatives A through D would affect similar percentages of vegetation that is compatible and not compatible with transmission lines. The differences among the alternatives are minor and are not a distinguishing factor, since for any of the alternatives the amount of vegetation requiring removal would be minimized to the extent practicable and areas would be revegetated and reclaimed in accordance with landowner requirements.

D.5.9 Biological Resources

Exhibit D-20, Biological Resources Effects Comparison, compares the length of each alternative that would cross mule deer severe winter range, elk severe winter range, Aztec gilia and Brack's cactus habitat, and the number of raptor nests within 0.25 mile of centerline. While this information was considered in the assessment, there were other factors, such as effects to biological resources from river crossings and effects to sensitive wildlife and big game habitat in BLM-managed SDAs that were also considered in determining biological resource effects from Alternatives A through F. A discussion of biological resource effects for each alternative is provided below.

Exhibit D-20

Biological Resources Effects Comparison

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Length crossing mule deer severe winter range (miles)	8.38	7.00	8.38	7.00	7.95	6.57
Length crossing elk severe winter range (miles)	8.09	8.04	8.09	8.04	6.63	6.58
Length crossing Aztec gilia and Brack's cactus habitat (miles)	0	0	2.20	2.20	6.56	6.56
Number of raptor nests within 0.25 mile of centerline	3	3	2	2	0	0

As shown in Exhibit D-20, Alternative A would not cross any areas of suitable habitat for the Aztec gilia or the Brack's cactus.

Alternative A has three possible raptor nests located within 0.25 mile of the centerline, which is the same as Alternative B and most of the alternatives analyzed. Effects to raptors from construction and maintenance activities could likely be avoided through design to locate the line in areas that would avoid effects to the extent practicable and through the implementation of design features or specific mitigation measures, such as seasonal restrictions.

Alternative A would cross the greatest length of mule deer severe winter range and elk severe winter range and would travel through the Thomas Canyon Recreation/Wildlife Area and East La Plata Wildlife Area, which are managed by the BLM for their unique habitat for wildlife and big game. Alternatives A and B would cross an additional 5.18 miles of SDAs compared to Alternatives C and D. In the Thomas Canyon Recreation/Wildlife Area and the East La Plata Wildlife Area, the transmission line and associated supporting infrastructure would not be consistent with existing land uses in the area. That is, there are no existing transmission lines and supporting infrastructure within these areas. Adding a transmission line in this area could result in habitat fragmentation. In the Thomas Canyon Recreation/Wildlife Area a transmission line would not be consistent with BLM's management objectives, which include managing the area for the optimal combination of primitive recreation opportunities and wildlife protection.¹⁸ Similarly for the East La Plata Wildlife Area, the transmission line and associated supporting infrastructure would not be consistent with the BLM's management objectives of managing the area to protect and preserve big game habitat.¹⁹

In addition, the NMDGF submitted a comment letter during EIS scoping that indicated a preference to avoid Route Segments 15, 21, 26, and 51 that are associated with Alternatives A and B because of

¹⁸ BLM 2003

¹⁹ BLM 2003

possible effects to various wildlife and avian species including big game, mule deer, Gunnison prairie dog, and bald eagle.

In Colorado, Alternative A would use Route Segments 44 and 46 and would cross a larger area of mule deer and elk severe winter range as compared to Route Segments 43 and 45 that are associated with Alternatives B, C, and F. Route Segments 44 and 46 cross 5.01 miles of mule deer severe winter range as compared to 3.63 miles for Route Segments 43 and 45. For elk severe winter range, Route Segments 44 and 46 cross 3.69 miles as compared to 3.64 miles for Route Segments 43 and 45. In an EIS scoping letter, the Colorado Division of Wildlife (now called Colorado Parks and Wildlife) expressed a preference for routing the line along Route Segments 43 and 45 over Route Segments 44 and 46 since Route Segments 43 and 45 are more heavily disturbed from existing roads and would have fewer effects to wintering deer and elk and would limit habitat fragmentation of these wintering habitats.

In addition, Route Segments 44 and 46 use the existing LPEA poles for a shorter distance (approximately 3 miles) than Route Segments 43 and 45 (approximately 4.5 miles). This means that Route Segments 44 and 46 would disturb a larger area than Route Segments 43 and 45. The existing LPEA poles can accommodate both the existing LPEA and new SJBEC Project transmission lines. This eliminates the need to disturb land and habitat to build this section of the SJBEC Project.

As shown in Exhibit D-20, Alternative B would not cross any areas of suitable habitat for the Aztec gilia or the Brack's cactus.

Alternative B has three possible raptor nests located within 0.25 mile of the centerline, which is the same as Alternative B and the most of the alternatives analyzed. Effects to raptors from construction and maintenance activities could likely be avoided through design to locate the line in areas that would avoid effects to the extent practicable and through the implementation of design features or specific mitigation measures, such as seasonal restrictions.

In New Mexico, effects to biological resources would be similar to those described above for Alternative A. Specifically, Alternative B

would cross the greatest length of mule deer severe winter range and elk severe winter range and would travel through the Thomas Canyon Recreation/Wildlife Area and East La Plata Wildlife Area, which are managed by the BLM for their unique habitat for wildlife and big game. Alternatives A and B would cross an additional 5.18 miles of SDAs compared to Alternatives C and D. In the Thomas Canyon Recreation/Wildlife Area and East La Plata Wildlife Area, the transmission line and associated supporting infrastructure would not be consistent with existing land uses in the area. That is, there are no existing transmission lines and supporting infrastructure within these areas. Adding a transmission line in this area could result in habitat fragmentation. In the Thomas Canyon Recreation/Wildlife Area a transmission line would not be consistent with the BLM's management objectives, which include managing the area for the optimal combination of primitive recreation opportunities and wildlife protection.²⁰ Similarly for the East La Plata Wildlife Area, the transmission line and associated supporting infrastructure would not be consistent with the BLM's management objectives of managing the area to protect and preserve big game habitat.²¹

In addition, the NMDGF submitted a comment letter during EIS scoping that indicated a preference to avoid Route Segments 15, 21, 26, and 51 because of possible effects to various wildlife and avian species including big game, mule deer, Gunnison prairie dog, and bald eagle.

As shown in Exhibit D-20, Alternative C crosses approximately 2.20 miles of suitable habitat for the Aztec gilia and the Brack's cactus. In addition, Alternative C has two possible raptor nests located within 0.25 mile of the centerline. Effects to the Aztec gilia, Brack's cactus, and raptors from construction and maintenance activities could likely be avoided through design to locate the line in areas that would avoid effects to the extent practicable and through the implementation of design features or specific mitigation measures.

²⁰ BLM 2003

²¹ BLM 2003

Alternative C would cross the greatest length of mule deer severe winter range and elk severe winter range as shown in Exhibit D-20. Similar to Alternative A in Colorado, Alternative C would travel along Route Segments 44 and 46 and would cross a larger area of mule deer and elk severe winter range as compared with for Route Segments 43 and 45 that are associated with Alternatives B, C, and F. Route Segments 44 and 46 cross 5.01 miles of mule deer severe winter range as compared to 3.63 miles for Route Segments 43 and 45. For elk severe winter range, Route Segments 44 and 46 cross 3.69 miles as compared to 3.64 miles for Route Segments 43 and 45. In an EIS scoping letter, the Colorado Division of Wildlife expressed a preference for routing the line along Route Segments 43 and 45 over Route Segments 44 and 46 since Route Segments 43 and 45 are more heavily disturbed from existing roads and would have fewer effects to wintering deer and elk and would limit habitat fragmentation of these wintering habitats.

In addition, Route Segments 44 and 46 would use the existing LPEA poles for a shorter distance (approximately 3 miles) than Route Segments 43 and 45 (approximately 4.5 miles). This means that Route Segments 44 and 46 would disturb a larger area than Route Segments 43 and 45. The existing LPEA poles can accommodate both the existing LPEA and new SJBEC Project transmission lines. This eliminates the need to disturb land and habitat to build this section of the SJBEC Project.

As shown in Exhibit D-20, Alternative D would cross approximately 2.20 miles of suitable habitat for the Aztec gilia and the Brack's cactus. In addition, Alternative D has two possible raptor nests located within 0.25 mile of the centerline. Effects to the Aztec gilia, Brack's cactus, and raptors from construction and maintenance activities could likely be avoided through design to locate the line in areas that would avoid effects to the extent practicable and through the implementation of design features or specific mitigation measures.

Among the alternatives analyzed, Alternative D would have the fewest overall effects to biological resources, since it would result in the least amount of overall disturbance to undisturbed areas and it would parallel existing transmission line infrastructure.

As shown in Exhibit D-20, Alternative E would cross approximately 6.56 miles of suitable habitat for the Aztec gilia and the Brack's cactus, which is the same as Alternative F and the most of any of the alternatives analyzed. No raptor nests were found to be located within 0.25 mile of the centerline. Effects to the Aztec gilia and Brack's cactus from construction and maintenance activities could likely be avoided through design to locate the line in areas that would avoid effects to the extent practicable and through the implementation of design features or specific mitigation measures.

Alternatives E and F would cross the most amount of land managed as SDAs. Specifically, Alternative E would cross the Rattlesnake Canyon Wildlife Area which is protected for the purpose of increasing wildlife habitat. The transmission line and associated supporting infrastructure would not be consistent with existing land uses in the area. That is, there are no existing transmission lines and supporting infrastructure within the Rattlesnake Canyon Wildlife Area. The transmission line would represent a new use that would not be consistent with the BLM's land use objectives to support increases in potential wildlife areas. Specific comments were received from the BLM FFO regarding the use of Route Segment 55. The BLM was concerned with potential effects to wildlife including further fragmentation of the Rattlesnake Canyon Wildlife Area. In addition, in an EIS scoping letter, the NMDGF expressed concern that Alternatives E and F would affect wildlife habitat for deer, elk, and turkey, as well as projects designed to improve habitat for those species. Additionally, there was concern that a route through the Rattlesnake Canyon Wildlife Area could affect areas with high densities of protected wildlife species.

In addition, Alternative E would require crossing the Animas River at a location that would require placing multiple structures in the river's floodplain and riparian areas. Alternatives A through D would cross the Animas River at a location where topography and river conditions allow for a single-span crossing that would not be located in floodplain and riparian areas. This difference is substantial in terms of minimizing effects to river and floodplain areas and fish and wildlife habitat during both construction and

maintenance of the transmission line. In an EIS Scoping letter, the NMDGF expressed a preference for routes that would use the northern Animas River crossing over a route that would use the southern river crossing.

Similar to Alternatives A and C in Colorado, Alternative E would travel along Route Segments 44 and 46 and would cross a larger area of mule deer and elk severe winter range as compared with for Route Segments 43 and 45 that are associated with Alternatives B, C, and F. Route Segments 44 and 46 cross 5.01 miles of mule deer severe winter range as compared to 3.63 miles for Route Segments 43 and 45. For elk severe winter range, Route Segments 44 and 46 cross 3.69 miles as compared to 3.64 miles for Route Segments 43 and 45. In an EIS scoping letter, the Colorado Division of Wildlife (now called Colorado Parks and Wildlife) expressed a preference for routing the line along Route Segments 43 and 45 over Route Segments 44 and 46 since Route Segments 43 and 45 are more heavily disturbed from existing roads and would have fewer effects to wintering deer and elk and would limit habitat fragmentation of these wintering habitats.

In addition, Route Segments 44 and 46 would use the existing LPEA poles for a shorter distance (approximately 3 miles) than Route Segments 43 and 45 (approximately 4.5 miles). This means that Route Segments 44 and 46 would disturb a larger area than Route Segments 43 and 45. The existing LPEA poles can accommodate both the existing LPEA and new SJBEC Project transmission lines. This eliminates the need to disturb land and habitat to build this section of the SJBEC Project.

As shown in Exhibit D-20, Alternative F would cross approximately 6.56 miles of suitable habitat for the Aztec gilia and the Brack's cactus, which is the same as Alternative E and the most of any of the alternatives analyzed. No raptor nests were found to be located within 0.25 mile of the centerline. Effects to the Aztec gilia and Brack's cactus from construction and maintenance activities could likely be avoided through design to locate the line in areas that would avoid effects to the extent practicable and through the implementation of design features or specific mitigation measures.

As described above for Alternative E, Alternative F would cross the most amount of land managed as SDAs. Specifically, Alternative F would cross the Rattlesnake Canyon Wildlife Area, which is protected for the purpose of increasing wildlife habitat. The transmission line and associated supporting infrastructure would not be consistent with existing land uses in the area. That is, there are no existing transmission lines or supporting infrastructure within the Rattlesnake Canyon Wildlife Area. The transmission line would represent a new use that would not be consistent with the BLM's land use objectives to support increases in potential wildlife areas. Specific comments were received from the BLM FFO regarding the use of Route Segment 55. The BLM was concerned with potential effects to wildlife including further fragmentation of the Rattlesnake Canyon Wildlife Area. In addition, in an EIS scoping letter, the NMDGF expressed concern that and Alternatives E and F would affect wildlife habitat for deer, elk, and turkey as well as projects designed to improve habitat for those species. Additionally, there was concern that a route through the Rattlesnake Canyon Wildlife Area could affect areas with high densities of protected wildlife species.

In addition, Alternative F would require crossing the Animas River at a location that would require placing multiple structures in the river's floodplain and riparian areas. Alternatives A through D would cross the Animas River at a location where topography and river conditions allow for a single-span crossing that would not be located in floodplain and riparian areas. This difference is substantial in terms of minimizing effects to river and floodplain areas and fish and wildlife habitat during both construction and maintenance of the transmission line. In an EIS Scoping letter, the NMDGF expressed a preference for routes that would use the northern Animas River crossing over a route that would use the southern river crossing.

D.5.10 Cultural Resources

Exhibit D-21, Cultural Resources Effects Comparison, compares the number of previously recorded cultural sites. Based on the information reviewed, Alternatives E and F had the fewest number of recorded sites (20 each), followed by Alternatives A and B

(21 each), and Alternatives C and D (28 each). While this information is useful, it is not particularly meaningful, since the differences among the alternatives are relatively small, given that there are likely to be many more sites than shown in the Exhibit D-21 below given the history of human development in the study area. In many cases, it is likely that most of the cultural sites for any of the routes could be avoided as part of the detailed design process. It may be that there are more previously recorded sites for Alternatives C and D than the other alternatives because they are located in areas where more cultural surveys have been completed in support of other development. In addition, the number of sites listed on the National Register of Historic Places (NRHP) was considered for Alternatives A through F; however, there were no listed sites found for any of the alternatives.

Exhibit D-21**Cultural Resources Effects Comparison**

Characteristics	Alternative A	Alternative B	Alternative C	Alternative D	Alternative E	Alternative F
Number of previously recorded sites crossed	21	21	28	28	20	20

In addition, Alternatives A through F would all cross the Old Spanish Trail, which is a National Historic Trail. The location where the alternatives would cross the trail depends on the alternative, though in general, Alternatives C, D, E, and F would cross the Old Spanish Trail about 1 mile south of New Mexico 574 and Alternatives A and B would cross the trail in the vicinity of Route Segment 21 shown on Exhibit D-2.

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